

University of Maryland
Department of Physics and Astronomy
College Park, Maryland

(PROGRESS REPORT)

NSG 695

(RESEARCH IN THE SPACE SCIENCES)

Period Covered:

(December 10, 1964 - June 10, 1965)

FACILITY FORM 602	N 66 80003	
	(ACCESSION NUMBER)	(THRU)
	4	None
	(PAGES)	(CODE)
	CR-67844	
	(NASA CR OR TMX OR AD NUMBER)	(CATEGORY)

National Aeronautics and Space Administration

October 1965

1. Introduction

The research supported by Grant NSG-695 is a joint cooperative research program involving the Department of Physics and Astronomy (DPA) and the Institute for Fluid Dynamics and Applied Mathematics (IFDAM) of the University of Maryland, and scientists of the Goddard Space Flight Center's Space Sciences Division.

The joint research programs during the period 12-10-64 through 6-10-65 were in the fields of plasma astrophysics research, solar spectroscopy, and particle physics. The research is jointly supervised by Goddard and University personnel in their studies of such problems as the stability of interplanetary plasmas, the structure of collisionless shock waves, the identification of lines in the extreme solar ultraviolet, and the spectra of cosmic ray protons. The following specific research was done during the above period under this grant.

2. Aharon Eviatar - Supervised by Drs. D. A. Tidman (IFDAM) and N. Ness (GSFC)

Mr. Eviatar is studying the physical consequences of enhanced fluctuations in stable plasmas that contain suprathermal particle fluxes. His work includes calculations of radio emission and enhanced diffusion for a number of 'noisy' astrophysical plasmas. Part of this work will appear in a paper entitled, 'Scattering of a Test-Particle by Enhanced Plasma Fluctuations' by D. A. Tidman and A. Eviatar, Phys. Fluids, 1965.

The role of ion waves in the structure of the earth's bow shock and the transition layer is being examined by the same technique.

3. Lee Foster - Supervised by Dr. D. A. Tidman (IFDAM) and
F. McDonald (GSFC)

Mr. Foster now has a working computer program for obtaining solutions of the Balescu-Lenard kinetic equation for an electron gas. It enables him to study collective effects such as wave-particle scattering on the evolution of particle distribution functions. He intends to use it to study the shape of the high-velocity tail of photo-electrons in the distribution function for electrons in the ionosphere. The photo-electrons give rise to Cerenkov waves of electron plasma oscillations. These waves in turn make a contribution to electron scattering which may be of comparable importance to the usual two-particle scattering processes.

4. T. Scott Smith - Supervised by Dr. E. v. P. Smith (DPA) and
W. Neupert (GSFC)

A summary of known ultraviolet lines in the spectral region 170-400 Å was completed. A list of lines identifiable from the OSO 1 solar XUV spectra was compiled. A Fortran program for computing daily averages and mean square deviations and for eliminating highly deviant initial readings and re-computing the averages and deviations was written. Semi-raw data was arranged and processed, yielding corrected daily averages and mean square deviations for 56 lines in the XUV spectra for all the universal time data available from the satellite. Data cards were generated with the daily averages and deviations in a format suitable for further investigating the correlations between the various lines.

5. Frank Huang - Supervised by Drs. F. McDonald and C. Fichtel
(GSFC and DPA)

Mr. Huang has been participating in a program to study low energy galactic cosmic ray protons using nuclear research emulsions flown on high altitude balloons from Fort Churchill, Manitoba. He is currently investigating a discrepancy between the low energy proton spectra obtained by the University of Chicago (Meyer and Vogt) and Goddard. In this work he is using a stack of emulsions flown in the summer of 1964 on the same balloon with the University of Chicago detector system. This work should be completed in the early Fall of 1965.

6. University Supervision

The principal investigators on this grant have been Professors H. Laster, E. v. P. Smith, and D. Tidman. They have supervised the selection of assistants and shared in their research direction.